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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 504,923	02 16 2000	Masamichi Harada	000155	6691

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EXAMINER

BEREZNY, NEAL

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 03/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/504,923

Applicant(s)

HARADA, MASAMICHI

Examiner

Neal Berezny

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 13 January 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) 9 and 10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-8 and 11-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 16 February 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-6, and 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meikle et al. (WO 96/17104). Meikle teaches a process for producing a barrier film by a heat CVD method which comprises the steps of providing a substrate on a substrate holder in a vacuum atmosphere within a CVD apparatus; p.4, ln.13-15, heating said substrate; p.4, ln.24-25, introducing a feedstock gas having a high temperature-melting point metal in its structure, and a reductive nitrogen-containing gas, such as ammonia, comprising a nitrogen atom into said vacuum atmosphere; p.4, ln.15-17, forming a film of the nitride of said high temperature-melting point metal on said substrate, wherein said step of forming said film of the nitride includes a plasma-free formation of said film, p.2, ln.1-18, wherein a nitrogen-free auxiliary reductive gas is introduced into said atmosphere; p.4, ln.29-30, introducing said auxiliary reductive gas together with said feedstock gas and said reductive nitrogen-containing gas into said vacuum atmosphere; p.4, ln.17-18, wherein a reductive Si-containing gas is introduced into said vacuum atmosphere; p.4, ln.19-21, wherein said reductive nitrogen-containing gas is introduced at a flow rate once of more higher than the flow rate of said feedstock

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gas, and said auxiliary reductive gas is introduced at a flow rate once or more, but not more than 5 times higher than the flow rate of said reductive nitrogen-containing gas; and wherein said auxiliary reductive gas is introduced at a flow rate once or more but not more than 15 times higher than the flow rate of the feedstock gas having said high temperature-melting point metal; p.4, ln.29 to p.5, ln.4.

3. Meikle appears not to specifically state the phrase that the taught process is plasma-free, but given the cited text, as well as the common usage of terminology in the art, the Meikle process is presumed to be plasma-free. Further, Meikle appears not to specifically state that the said auxiliary reductive gas is introduced at a flow rate twice or more of the nitrogen-containing gas flow rate. It would have been obvious to one of ordinary skill in the art at the time of the invention to increase the auxiliary reductive gas flow rate, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Applicant is reminded that demonstrating the critical nature or unexpected results arising from seemingly obvious variations in optimum ranges is an effective means of demonstrating non-obviousness.

4. Claims 7 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meikle as applied to claims 1-6, and 11-16 above, and further in view of Chern et al. (6,500,743). Meikle teaches a diluent gas not reacting with said high temperature-melting point metal, p.4, ln.15-18, so that the pressure of said vacuum atmosphere is regulated to 1 Pa or more but not more than 100 Pa; p.4, ln.22-24. Meikle does not

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teach the use of a gas having an oxygen atom in its chemical structure. Chern teaches the practice of stuffing oxygen into deposited titanium nitride barrier layers, col.15, ln.41-58. It would have been obvious to one of ordinary skill in the art at the time of the invention to include oxygen in the diluent gas in order to oxidize any contaminate, such as carbon, thus removing the carbon from the barrier layer, resulting in improved stability in the film and lower resistivity, as taught in the cited text of Chern.

5. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meikle as applied to claims 1-6, and 11-16 above, and further in view of Lu (EP 0 840 363 A1). Meikle appears not to teach exposing the surface of the substrate to a plasma of hydrogen gas and a plasma containing at least one gas selected from among argon, nitrogen, and helium gases. Lu teaches exposing the surface of the substrate to a plasma of hydrogen gas and a plasma containing at least one gas selected from among argon, nitrogen, and helium gases; fig.1, el.103. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Lu with Meikle to plasma treat the surface of the wafer in order to obtain additional control of the film/substrate interface chemical composition, see Lu col.3, ln.6-8.

Response to Arguments

6. Applicant's arguments with respect to claims 1-8, and 11-17 have been considered but are moot in view of the new ground(s) of rejection.

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Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Neal Berezny whose telephone number is (703) 305-1481. The examiner can normally be reached on M-F 9:00 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7724 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

NB
March 23, 2003

A handwritten signature in black ink, appearing to be "NB" followed by a stylized flourish.